

## **REMARKS**

Favorable reconsideration of the above-identified application is requested in view of the following remarks.

Examiner Reichle is thanked for the careful examination of this application and for indicating that Claim 5 defines allowable subject matter.

Claims 14-23 are newly added by this amendment and Claims 3-5 are canceled, with Claim 2 remaining canceled. Thus, Claims 1 and 6-23 are currently pending in this application with Claims 1 and 14 being the only independent claims.

## **REJECTIONS OF THE CLAIMS**

The subject matter previously defined by Claims 3, 4 and 5 is now generally defined by Claim 1. Also, the subject matter previously defined by Claims 1, 4 and 5 is now generally defined by new independent Claim 14. Claim 5 previously defined subject matter that is not taught or suggested by the cited references and is allowable, as indicated on the bottom half of page 10 of the Official Action. Therefore, Claims 1 and 14 should be allowable at least because they include the allowable subject matter previously defined by Claim 5. Also, Claims 6-13 and 15-23 depend from Claims 1 and 14 and should therefore be allowable at least for the same reasons as Claims 1 and 14, respectively.

On the bottom of page five of the Official Action, Claims 3-5 are rejected under 35 U.S.C. § 112. Claims 3-5 are canceled by this amendment thereby obviating this rejection.

**OBJECTIONS TO SPECIFICATION**

On page two of the Official Action it is indicated that the previously submitted substitute Abstract of the Disclose is not accepted because a marked up version was not provided. Accordingly, with this amendment, a marked up version showing changes and a clean version is provided. It is therefore requested that the substitute Abstract of the Disclosure be accepted.

On page two of the Official Action, it is indicated that the previously submitted substitute specification was not accepted because: 1) the specification did not have numbered pages; 2) subsection "MODES...INVENTION" should be --DETAILED DESCRIPTION--; 3) on page 8, line 2, the interconnecting lines 10-13 do not connect portions 5-7; 4) the arrows in Fig. 6 are not described; and 5) a calculation from 25 mm to 40 mm is not shown.

A substitute specification is again submitted by this amendment, along with a marked up version, thereby addressing the issues raised in the Official Action. No new matter is included in the substitute specification. Specifically, each of the above noted issues are addressed below.

The presently submitted substitute specification includes page numbers on both the marked up version and the clean version.

The subsection title "MODES FOR CARRYING OUT THE INVENTION" is replaced with the subsection title --DETAILED DESCRIPTION--.

The comment on page two of the Official Action, indicating that on page 8, line 2 of the specification the interconnecting lines do not connect portions 5-7, is not understood. It is respectfully submitted that the lines 10-13 are illustrated as connecting the portions 5-7. It is therefore requested that should this proposition be

maintained that it be more specifically explained how the Official Action is interpreting the specification to draw this conclusion.

Numerical characters --61-- and --62-- are added to correspond to the arrows in Fig. 6. Also, description of the arrows is provided on page 16, lines 4-5.

On page 15, lines 14-16 of the substitute specification, or page 16, lines 1-3 of the annotated specification, a description of the calculation from 25 mm to 40 mm is shown.

As noted above, applicants have amended the specification as required and request that this present replacement specification be entered.

### ***Priority***

It is noted that on page 1 of the specification that "Priority... 119" should be --benefit-- and "2000" should be --2001--. These changes are made by this amendment

### ***The drawings***

Beginning on the bottom of page two of the Official Action it is indicated that the previously submitted replacement drawings are not accepted because: 1) text in Fig. 6 should be avoided, and 2) the invention defined by Claims 3-6 and 11 must be shown. The last portion of Claim 3 is specifically identified as a claimed feature that should be illustrated. Replacement drawing sheets are submitted by this amendment and are believed to address the issues raised in the Official Action. The specific changes to the drawings are detailed below.

In Fig. 3, numerical characters --33-- and --40-- are added to correspond to a feature of Claim 3.

In Fig. 6, numerical characters --61-- and --62-- are added and correspond to features of Claim 3. Also, the text is removed.

Claims 7a-7c are added and illustrate a hook-and-loop fastener 32a as well as fibers for attachment to a hook-and-loop fastener on the inner layer 4. This subject matter is referred to in Claims 4 and 5.

Claims 8a-8c are added and illustrate a pressure-sensitive adhesive 32b and an elastic part 29a arranged to stretch upon occurrence of load during use of the article. This subject matter is referred to in Claims 6 and 10. It should be noted that the Official Action seems to have inadvertently specifically referred to illustration of the features of Claim 11, because the subject matter of Claim 11 is impossible to simply illustrate. It is assumed that it was meant to refer to Claim 10.

Should these amendments not be considered adequate, and should this objection be maintained as a result, it is requested that it be specifically and exactly indicated which features the Examiner is interested in having illustrated and how it is desired that this be done.

### ***The description***

The length of the Abstract of the Disclosure is objected to. Accordingly, the substitute Abstract of the Disclosure is less than 150 words.

On the top of page four of the Official Action, it is proposed that the specification is not written in full, clear, concise and exact terms. The Official Action points to the first sentence of the second paragraph of the specification to exemplify

these alleged inadequacies. This sentence is written in correct English and it is not understood what the basis for this objection is. Are the sentences too long? Are the descriptions unclear in some way? It is respectfully submitted that the specification is full, clear, concise and in exact terms. Therefore, should this objection be maintained, it is requested that the Official Action more specifically identify the specific items in the specification that are the basis for this objection, or that the objections be withdrawn.

On the middle of page four of the Official Action it is indicated that on page 4, line 3 of the specification that "Patent Specification" should be deleted, and that on page 5, line 1 of the specification "DISCLOSURE" should be "SUMMARY." These suggested changes have been made.

On the middle of page four of the Official Action, an issue is raised regarding claim language directed to a breaking force with regard to a strip of 40 mm width and the lack of a corresponding test method in the specification. See the amendment to the specification at page 16, lines 1-3 of the annotated specification or at page 15, line 14-16 of the substitute specification. However, it is not necessary to present a test method corresponding to a claimed feature and the objection should be withdrawn. With respect to the inquiry regarding the width, it should be correct.

An issue was raised regarding trademarks on page 17, lines 6 and 10 of the specification. The words at issue, "Tredegar, Fabriflex and Pegas" are capitalized and identified as being trademarks by this amendment.

Beginning on the bottom of page four of the Official Action, it is proposed that there is not proper antecedent basis in the specification for the recitation of "relative"

strength of the bonds referred to in previous Claim 5. See the amendment to the specification at page 10, lines 26-29.

***Claims objections***

On the top half of page five of the Official Action, a number of issues regarding informalities in the claims are raised with respect to Claims 1, 3 and 5. In accord with suggestions made in the Official Action: in Claim 1, --and-- is inserted after "folds," --face-- is inserted after "bonding," and a comma is placed after "condition" and removed from after "fasteners"; In Claim 4, "the" is changed to --each--; and in Claim 5, "relatively" is changed to --relative--.

**CONCLUSION**

For at least the reasons stated above, it is requested that all the rejections and objections be withdrawn and that this application be allowed.

In the event that there are any questions relating to this Amendment, or the application in general, it would be appreciated if the Examiner would telephone the undersigned attorney concerning such questions so that the prosecution of this application may be expedited.

Respectfully submitted,

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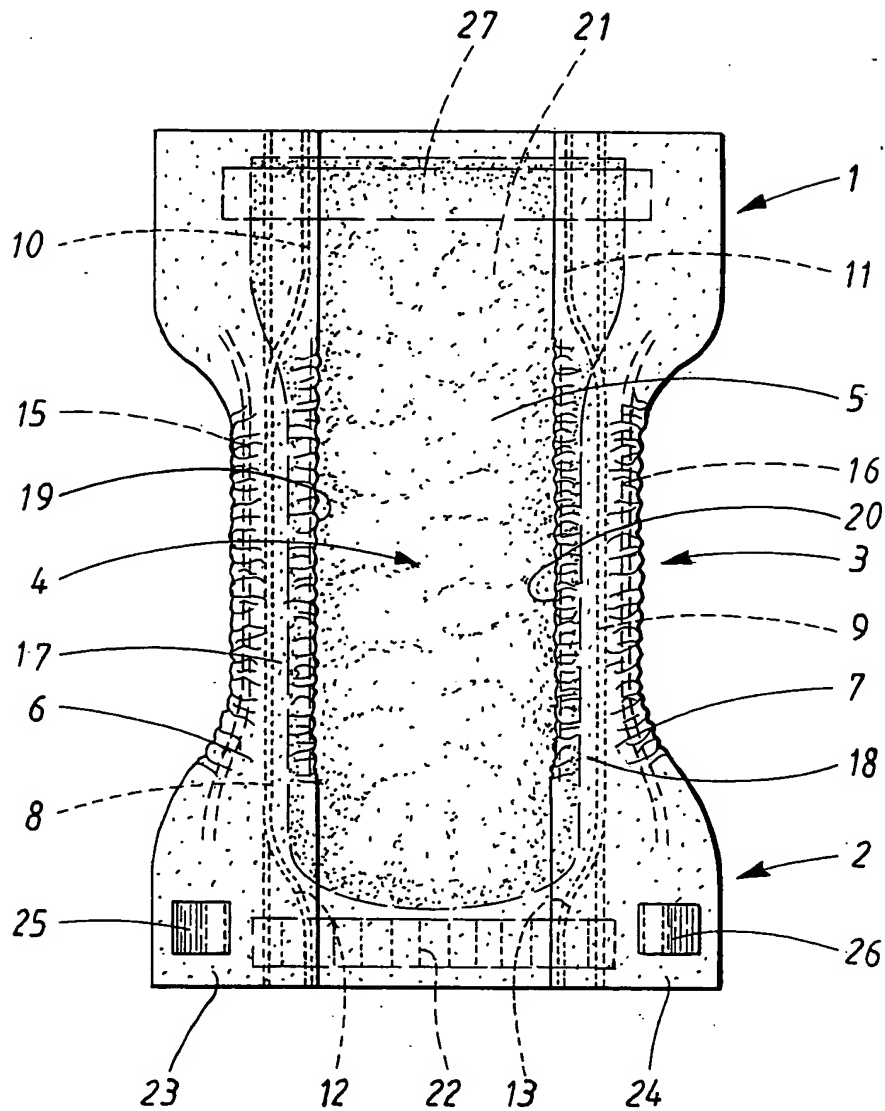


FIG. 1

~~2/4~~

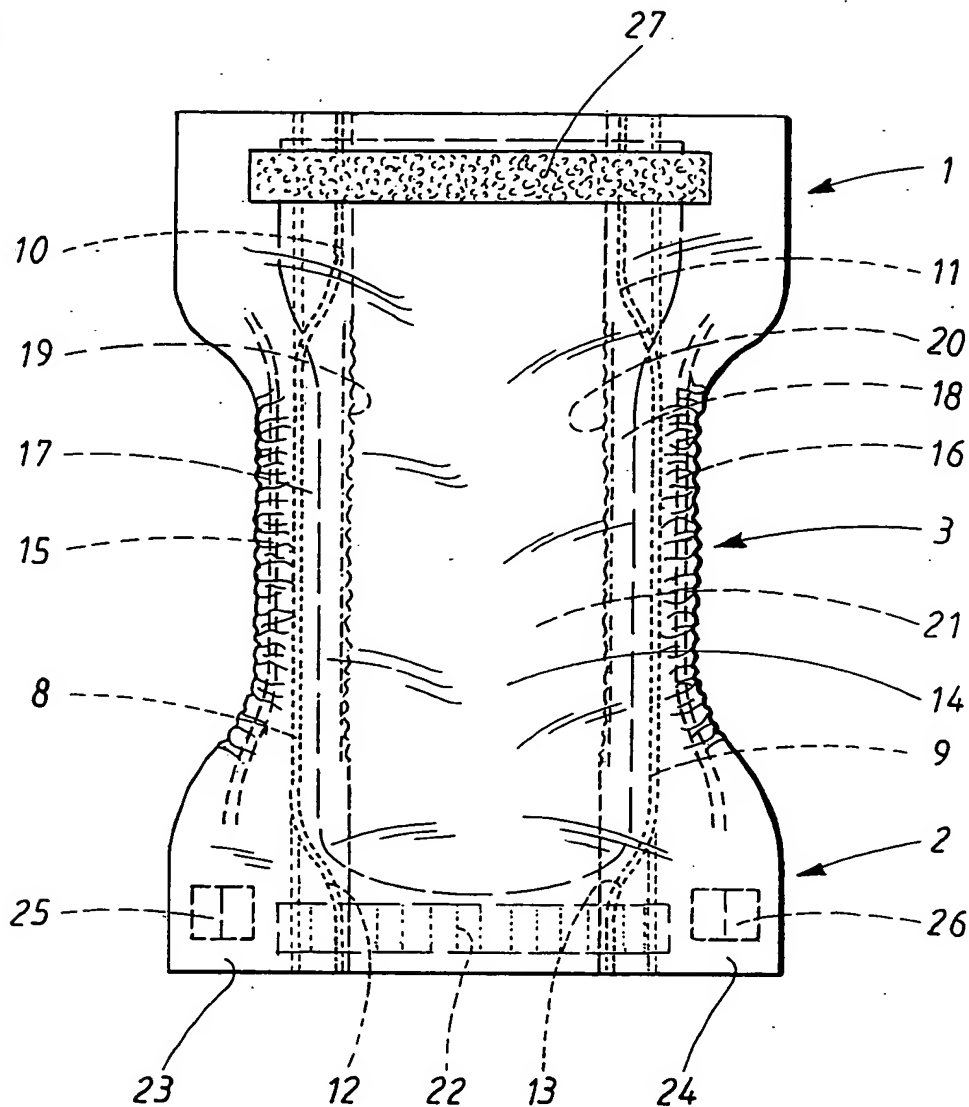


FIG. 2

~~3/4~~

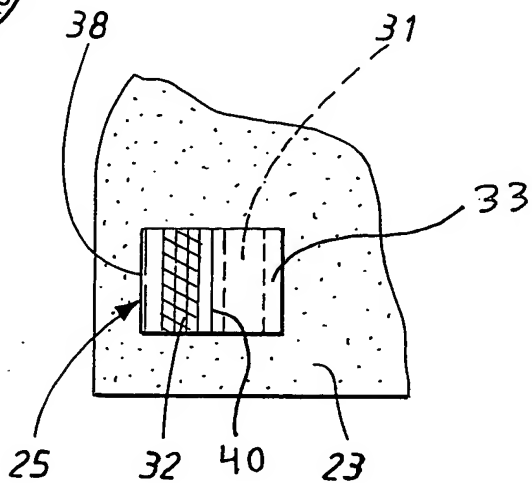


FIG. 3

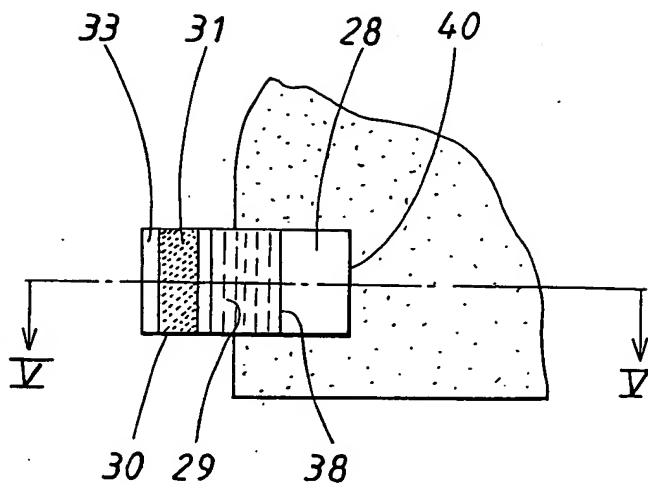


FIG. 4

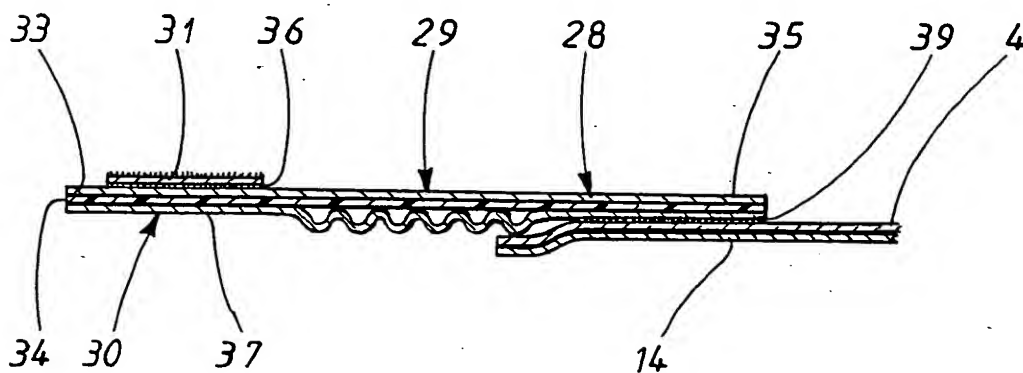


FIG. 5



~~A1 = ADHESION BREAK,  
GLUE REMAINS ON CARRIER~~

~~A2 = ADHESION BREAK, GLUE  
TRANSFERRED TO THE OPPOSITE  
MATERIAL~~

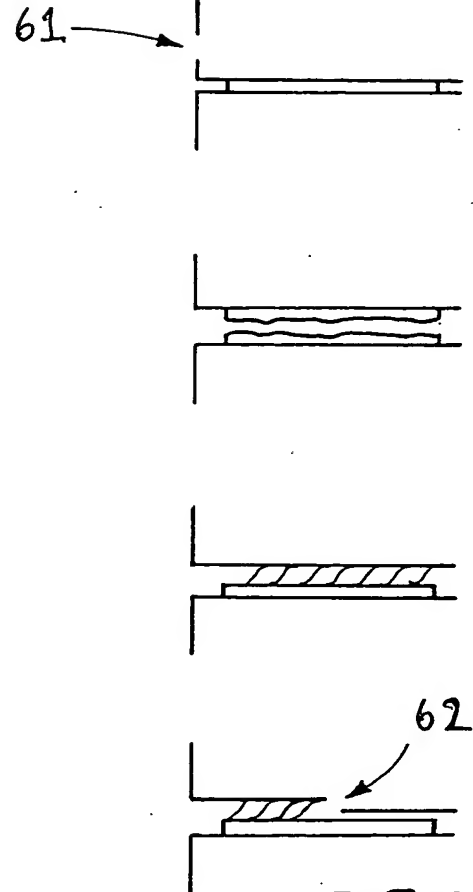
~~A3 = ALTERNATIVE ADHESION BREAK~~

~~B = RUPTURE OF MATERIAL  
EXTERNALLY OF BOND~~

~~C = DEFECTIVE COHESION,  
GLUE SHATTERED~~

~~E1 = MINOR FIBRE RUPTOR~~

~~E2 = RUPTURE OF MATERIAL IN BOND~~



~~SEPARATION CODE KEY~~

FIG. 6

## Mechanical Tape Fastening System for Disposable Absorbent Articles

This application claims ~~priority under 35 U.S.C. § 119 to the benefit of~~ U.S. Provisional Application No. 60/262,657 entitled MECHANICAL TAPE  
5 FASTENING SYSTEM FOR DISPOSABLE ABSORBENT ARTICLES and  
filed on 22 January 2000 2001, the entire content of which is hereby  
incorporated by reference.

### TECHNICAL FIELD

10 The present invention concerns a disposable absorbent article, such as an  
baby diaper, an incontinence diaper or the like, comprising a first end portion  
and a second end portion, which portions are intended completely or partly to  
enclose the user's waist area during use of the article, and an intermediate  
crotch portion, said portions comprising an inner layer, which is turned  
15 towards the user during use and ~~which~~ is liquid-permeable at least in the  
crotch portion opposite the user's genitals, a liquid-impermeable outer layer,  
and an absorbent body disposed between said outer and inner layers, ~~said,~~  
The article being is formed in the area of the second end portion with  
mechanical tape fasteners intended, upon application of the article, to be  
20 detachably interconnected with one or several fastening parts disposed on  
the outer layer of the first end portion and being complementary to said tape  
fasteners.

### BACKGROUND ART

25 Various types of fasteners have been used for attaching disposable  
absorbent articles, ~~such as e.g.,~~ baby diapers, incontinence diapers or the  
like, around the user's waist. ~~As examples of Exemplary fasteners may be~~  
~~mentioned~~ are adhesive tape fasteners and mechanical tape fasteners.  
Adhesive fastener systems allowing tape ends to be repeatedly fastened,  
30 unfastened and re-fastened have been available on the market since the  
beginning of the 80s 1980s. One adhesive tape fastener system of this type  
is described in US 5 024 672.

~~In analogy with the expressions~~ Analogous to adhesive tape fastener systems and adhesive tape fasteners are ~~used herein the expressions~~ mechanical tape fastener systems and mechanical tape fasteners to define fastener systems and fasteners. In such mechanical systems and fasteners, ~~wherein~~ the bond is effected not by adhesive means but by means of mechanical interlocking between hooks disposed on one of the parts of a fastening known as a hook-and-loop fastener and loops, apertures or fibre filaments disposed on the other hook-and-loop fastener part.

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In most respects, modern adhesive tape fastener systems function satisfactorily. ~~[[A]] However, a~~ serious problem is, ~~however~~ the deteriorated quality of the adhesion, should ~~for example, e.g.,~~ talcum powder or baby oil be spilled onto the pressure-sensitive adhesive substance or onto the bonding face to which the tape is to be attached. This problem may be removed by using mechanical tape fastener systems. In addition, consumers want disposable absorbent articles that are soft to the touch and have a textile-like appearance as opposed to the plastic films of which ~~earlier~~ outer layers of earlier disposable absorbent articles were predominantly formed.

15

Hitherto, mechanical tape fastener systems have been too expensive to compete with adhesive tape fastener systems. In recent years novel mechanical tape fastener systems have, ~~however~~ been developed that are more price-competitive. This fact, in conjunction with the increasing use of textile-like outer layers and elimination of the problems caused by spillage on the bonding faces ~~have,~~ has contributed to manufacturers of disposable absorbent articles using mechanical tape fastener systems more ~~and more~~.

20

25

By applying mechanical tape fasteners on both sides of, e.g., the rear end portion of a diaper, and providing a complementary bonding face on the external face of the opposite end of the diaper in a manner corresponding to that described in ~~the above patent specification, US 5 024 672, the 672.~~ The problem of fastening of the diaper as it is being put on, unfastening and

30

refastening thereof is solved in the principally corresponding manner. Such a mechanical tape fastener system is described in e.g. EP-A1-0324578. This publication also touches on the problem involved in sealing a used diaper such that it forms a closed package for reliable enclosure of ~~faeces~~ feces inside the diaper, and the publication describes one means of solving this problem.

The latter publication mentions the problem arising because the mechanical tape fastener may unintentionally hook onto parts of the diaper before attachment to the intended bonding face has been made.

Over the years, the permanent anchorage of tape fasteners has been subject to much development, and many suggested solutions have been presented in the patent literature. This is ~~true also as concerns~~ true of the problem of protecting the bonding face of the tape fasteners from unintentionally adhering where not wanted before the diaper is put on. The tape fasteners, which are anchored to the article by the producer in the process of the manufacture of the article, are exposed to considerable stress as the diaper is being put on and the forces arising in connection therewith are absorbed by the point of anchorage. If the tape fastener is attached to the external layer of the article only, there is a risk that this layer be torn as the article is being put on. This problem is discussed ~~already~~ in US 3 867 940, and the solution suggested ~~in that patent specification~~ therein is to reinforce the external layer in the area of the point of anchorage.

The solution most predominantly found on the market and also in the patent literature is the use of the so-called Y-tape, which comprises two branches that are applied about the edge portion of the diaper, with one branch on the external layer and the other on the inner layer, thus making use of the inherent strength of the inner as well as of the external layer. The above publication EP-A1-0324578 and WO 95/05140, ~~for example e.g.~~, disclose a Y-tape designed for mechanical tape fasteners.

One disadvantage inherent in Y-tapes is that they have to be attached during manufacturing on both sides of an edge portion of a disposable absorbent article, such as a diaper, ~~during manufacturing~~. The manufacturing takes  
5 ~~place in the form of~~ utilizes a web travelling at a very high speed, a feature that makes the application of Y-tapes very complex. A further disadvantage is that the position of tape fasteners, applied around the edge portion of the rapidly advancing web of articles, ~~such as diapers~~, may lead to serious drawbacks, both as regards the freedom of changing the manufacturing  
10 process and the freedom of changing the article itself.

Another prior-art solution is the so-called Z-folded tape, which is anchored permanently to the external face of the outer layer of the article. A Z-folded tape is shown e.g. in US Patent Specification 4 576 598. A drawback  
15 inherent in Z-folded tapes is that they are attached to the external face of the outer layer of ~~for instance, e.g., a diaper, with the~~. The result is that the Z-tape, once attached, is unprotected during the subsequent processing steps, ~~said steps which~~ usually including cross-cutting, cross-folding and insertion in a bag. To some extent this is applicable also to diapers comprising Y-tapes.

20 In the storage condition of the article, i.e., before it is used, adhesive and hook-on fastening parts on the tape fasteners should be safely covered in order to prevent unintentional hook-on or adhesion, ~~respectively~~, that makes handling of the article more difficult as the latter is being put on. Hitherto, this  
25 problem usually has been solved by ensuring that in the storage condition of the tape fasteners, adhesive parts on ~~said the~~ fasteners, including ~~on~~ mechanical tape fasteners, abut against release-agent coated plies of material. A solution of this kind is described for instance in the above mentioned EP-A1-0 324 578. Release-agent coatings are, however,  
30 comparatively expensive while at the same time they often require the provision of an additional layer of material in the tape fastener, which makes the design of the latter more complex. When mechanical tape fastener

systems are used, it is ~~of course~~ conceivable to arrange for the mechanical bonding faces of the tape fastener, in the storage condition of the latter, to abut against and be mechanically interconnected with a part of a hook-and-loop fastener that is complementary to said bonding face. If a safe  
5 interconnecting bond is wanted, a solution of this kind ~~does, however require~~ requires the provision of complementary bonding faces for all mechanical fasteners of the article, with resulting increased material costs for and a more complex manufacture of said article.

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#### DISCLOSURE SUMMARY OF PREFERRED EMBODIMENTS INVENTION

By means of the present invention, the above problems found in absorbent articles of the kind defined in the introduction have been eliminated.

15 For this purpose, the article in accordance with the invention ~~is characterised in that the article~~ comprises at least two of said tape fasteners, which are arranged on the inner layer of the article at opposite side portions of said second end portion,

20 ~~that wherein~~ the tape fasteners have one longitudinal and one transversal extension,

~~that wherein~~ said tape fasteners are permanently joined to the inner layer of the article by means of a producer's bonding face arranged on a first end part  
25 of the tape fasteners,

~~that wherein~~ a user's bonding face is arranged on the opposite second end part of the fasteners, the user's end part,

30 ~~that wherein~~ prior to use of the article, the tape fasteners are arranged in a folded storage condition, each one of said tape fasteners being formed with an odd number of folds and the bonding faces of both said producer's

bonding face and said user's bonding face being turned towards the inner layer of the article,

5     ~~that~~ wherein the user's end parts of two opposite tape fasteners face one another in said storage condition and ~~that wherein~~ in the storage condition of said article individual fold parts are joined to at least one of the other fold parts by means of a bond, preferably in the form of thermal or ultrasonic welds, said bond being breakable in order to establish the position of use of said tape fasteners.

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Because the mechanical tape fastener is attached to the inner face of the inner layer of the article, the manufacturing process may be performed in a simpler and more reliable manner than in the case of the prior-art solutions involving Y-tapes. All folding steps with regard to the mechanical tape fasteners for the article in accordance with the present invention may be performed at a considerable lower speed than at the high web velocities found in modern machines for rational and competitive production of disposable absorbent articles, such as baby diaper. Anchorage of the fully folded mechanical tape fastener in accordance with the present invention onto the web of articles travelling at a high speed may be effected in a more controlled way than when Y-tapes are used, which, ~~when they are to be applied,~~ need to be folded about the edge portion of individual articles. To attach the mechanical tape fasteners to the article in accordance with the teachings of the present invention only the producer's bonding face need to be applied against the inner layer and be connected to that layer, ~~which from~~ From a production point of view, such application is simpler and offers a larger degree of freedom as concerns production changes and replacements of the materials of which the article is constructed.

30     By the expression breakable bonds as used herein is to be understood bonds that do not require supplementary materials such as release coatings or an additional bonding zone designed solely for the storage condition of the tape

fastener. Preferably, the bonds are in the form of thermally or ultrasonically produced welds.

5 In their condition of storage, the tape fasteners preferably are arranged in their entirety on the inner layer, with the laterally outermost end edges of the tape fasteners being located interiorly of the lateral edges of said lateral portions. In this manner, the tape fasteners are well protected during the subsequent processing steps, particularly in the case of the conventional  
10 hourglass-shaped disposable absorbent articles discussed herein, i.e. baby diaper, adults' diapers and the like, wherein the tape fasteners are arranged on lateral portions that are folded inwards prior to cross-cutting, cross-folding and insertion into packages.

~~Another~~ In another suitable embodiment of the invention ~~is characterised in that,~~  
15 ~~that,~~ in the condition of storage of the article, the mechanical tape fasteners comprise one fold only and in that the latter forms the laterally outermost end edge of the tape fastener in said storage condition, that the tape fasteners comprise a middle part, which by means of said breakable bond is connected to the first end part and which covers the latter, and in that when the user's  
20 bonding face is in said folded storage condition, the opposite end part is located laterally interiorly of the first end part.

Additional preferred embodiments will appear from the appended claims.

## 25 BRIEF DESCRIPTION OF DRAWINGS

The invention will be described in closer detail in the following with reference to the accompanying drawings, wherein:

Fig 1 shows a baby diaper and a flat, extended position and as seen from  
30 the inside towards the inner layer of the diaper.

Fig 2 shows the baby diaper of Fig 1 in a flat, extended position as seen from the outside towards the outer layer of the diaper.

5 Fig 3 is a view on an enlarged scale of a corner portion of the diaper of Fig 1, showing a mechanical tape fastener in condition of storage attached to the inner layer of the diaper.

Fig 4 is a view of the corner portion of Fig 3, showing the tape fastener in the position of use.

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Fig 5 is a sectional view along line V-V of Fig 4, shown on a larger scale.

Fig 6 is a schematic view of different types of bond ruptures obtained by means of a method of testing the strength required to break a bond in the tape fastener in the storage condition of the latter.

15

Fig 7a is a view on an enlarged scale of a corner portion of a diaper according to an embodiment, showing a mechanical tape fastener in condition of storage attached to the inner layer of the diaper.

20

Fig 7b is a view of the corner portion of Fig 7a, showing the tape fastener in a position of use.

Fig 7c is a sectional view along line V-V of Fig 7b, shown on a larger scale.

25

Fig 8a is a view on an enlarged scale of a corner portion of a diaper according to an embodiment, showing a mechanical tape fastener in condition of storage attached to the inner layer of the diaper.

30 Fig 8b is a view of the corner portion of Fig 8a, showing the tape fastener in a position of use.

Fig 8c is a sectional view along line V-V of Fig 8b, shown on a larger scale.

~~MODES FOR CARRYING OUT THE INVENTION~~ DETAILED DESCRIPTION

- 5 The baby diaper illustrated in the drawing is hourglass-shaped, including a first end portion 1, a second end portion 2, and an intermediate crotch portion 3. The diaper comprises an inner layer 4 consisting of a longitudinally extending middle portion 5, the central area of which is liquid-permeable and which consists of, e.g., a fibre fiber cloth, a so-called non-woven fabric, and
- 10 two longitudinally extending lateral edge portions 6, 7, which preferably are liquid-impermeable or hydrophobic. The middle portion 5 is connected to the lateral edge portions 6, 7 by means of interconnecting lines ~~8,9~~ 8, 9 and ~~10,11,12,13,~~ 10, 11, 12, 13, said interconnecting lines preferably being in the form of ultrasonic welds. The lateral portions 6, 7 may ~~consists~~ consist of a
- 15 non-woven fabric that has been treated to make it hydrophobic, or ~~else it could consist~~ of some other liquid-impermeable material known to the expert. The inner layer comprised of said portions is joined at least along its lateral and end edges to an external layer 14, which in the present case is formed in one piece from a liquid-impermeable material, such as a laminated product of
- 20 polyethylene and a thin outer layer of a fibre fiber cloth.

- Along the edges of the crotch portion 3, the diaper is provided with leg-abutting elastic means 15, 16. The lateral portions 6, 7 overlap the middle portion somewhat laterally, forming inner barriers 17, 18 serving to prevent
- 25 urine and faeces from spreading sideways in the diaper in the direction towards the diaper edges. The barriers 17, 18 are provided at their inner edges with pre-stressed elastic bands or threads 19, 20, which extend essentially along the crotch area of the diaper and which are arranged, when the diaper is in use, to make the barriers stand up from the inner layer. In the
- 30 end portions of the diaper, the barriers are kept in a position of abutment against the middle portion 5 by means of the interconnecting lines 10-13. An absorbent body 21 is enclosed between the outer layer 14 and the inner layer

4. In accordance with the shown embodiment, the absorbent body 21 widens somewhat in the area of the first end portion 1, the front portion, and has a softly rounded configuration in the opposite end portion, the rear portion 2 of the diaper. The absorbent body 21 could consist ~~for instance of, e.g.,~~  
5 cellulose fluff having mixed therein high absorbent materials in the form of particles or ~~fibres~~ fibers.

At the rear portion 2 of the diaper, a pre-stressed elastic waistband 22 is provided between the outer and inner diaper layers.

10

At the two opposite lateral portions 23, 24, viz. the corner portions of the rear diaper portion 2, the diaper is provided with mechanical tape fasteners 25, 26, which are permanently joined to the inner layer 4 by means of a producer's bonding face. At the opposite end portion 1 of the diaper, viz. the  
15 front portion, a bonding face, complementary to the mechanical tape fasteners, is arranged on the external face of the outer layer 14, as most clearly apparent from Fig 2. This bonding face is formed by an elongate band 27, serving as one of the parts of a fastening of the kind known as a hook-and-loop fastener, the other part of which is formed by a user's bonding face  
20 on the tape fasteners as will be described in closer detail in the following. The material of the elongate band 27 is formed with apertures, loops or ~~fi~~fiber filaments for co-operation with hooks formed on the tape fastener. Examples of suitable materials for the elongate band are described in the ~~above-mentioned patent specification~~ EP-A1-0 324 578.

25

Fig 3 illustrates a mechanical tape fastener 25 as attached in its storage position to the inner layer of the corner portion 23. The tape fastener is pre-fabricated and is applied in folded condition, the single fold 38 forming the laterally outermost end edge of the tape fastener. Between the fold 38 or end  
30 edge and an edge 40, the fastener is formed with a producer's bonding face 28, 28 (see Fig. 5, 5) which is coated with an adhesive 39 for permanent anchorage of the tape fastener in the process of manufacture of the baby

diaper. In accordance with the shown embodiment, the tape fastener comprises a support strip comprising three layers, which will be described in more detail with reference to Fig 5. The support strip essentially has three sub-parts, which are most clearly apparent from Figs 4 and 5. One sub-part

5 is formed by the producer's bonding part 28 that extends between the fold 38 and the edge 40. In addition, there is a middle part 29 and a distal part 30. One of the parts of a hook-and-loop fastener is applied on that latter part, said part being a strip formed with a users' bonding face 31 in the form of hooks or the like, said hooks projecting from the strip and, upon use of the

10 hook-and-loop fastener as the diaper is being put on about the waist of the user, being anchored in the elongate band 27 that forms the other part of the hook-and-loop fastener. In one embodiment, the inner layer 4 of the article comprises fibers in which the hooks of the user's bonding face 31 fasten to form a weak bond relative to the hook-and-loop fastener and the bond

15 between the middle part 29 and the first end part. Examples of a mechanical tape-attachment part formed with hooks or the like to form said users' bonding face 31 are shown in the ~~previously mentioned Patent Specification~~ EP-A1-0 324 578.

20 In its storage condition, the tape fastener 25 is folded as shown in Fig 3, and in 3. In this condition the middle part 29 is joined to the producer's part 28 by means of a bond in the form of thermal or ultrasonic welds. Fig 3 shows this bond 32 in the form of a pattern of linear welds. The advantage of this type of bond is that no additional material in the form of glue or release-agent

25 coatings and associated support strips are needed. In the storage condition, the users' bonding face 31 including the hooks and similar means thereon is protected by the support strip of the tape fastener and there is no risk for unintentional hook-on of the bonding face before the bond 32 is broken. The inner layer of a baby diaper usually has a textile-like open fibrous face to

30 which the bonding face 31 of the mechanical tape fastener adheres somewhat, and in the storage condition, the bonding face 31 adheres weakly to the inner diaper layer at the corner portion 23. The outer edge portion 33

externally of the bonding face 31 could alternatively be provided with a pressure-sensitive bonding agent (not shown), ~~serving.~~ The bonding agent serves both to bind the distal part of the tape fastener stronger to the inner layer of the diaper in the storage condition of the latter and to seal the used  
5 diaper such that a package is formed enclosing urine and ~~faeces~~ feces inside the diaper.

The support strip of the tape fastener 25 is a three-ply strip as ~~appears from shown in~~ Fig 5. An intermediate ply 34 in the form of an elastic film, which is  
10 elastically stretchable when exposed to stress in conjunction with the putting-on of the diaper and as the infant moves. Stress normally occurring in conjunction with the putting-on of the diaper is in the order to 200-2000g, the stress being higher on the tape fastener that is secured the last compared with that on the tape fastener that is secured first. Stress load arising during  
15 use of the diaper as a result of the movements of the infant is in the order of 100-500g, possibly somewhat higher in the case of chubby infants.

In accordance with the shown embodiment, a ply 35 of a non-woven fabric is laminated together with the elastic film. The non-woven ply follows the  
20 movements of the elastic film. The strip formed with the mechanical bonding face of the tape is joined to said non-woven ply 35 by means of a bonding agent 36. A ply 37 of a non-elastic fabric is attached to the opposite face of the elastic film 34. By non-elastic as used in ~~this case~~ herein, is to be understood that the ply 37 does not stretch when subjected to the stress to  
25 which the tape fastener is exposed during use of the diaper. Along the producer's bonding part 28 and along the distal part, the non-elastic non-woven ply is joined to the elastic film, with the result that the elastic capacity of the latter is lost in these areas. In the middle part 29, however, the non-elastic non-woven ply is corrugated and joined to the elastic film at spaced-  
30 apart points only, as shown in Fig 5. Consequently, the middle part of the tape fastener is elastically stretchable from the position of Fig 5 to the completely extended position, wherein the corrugations of the non-elastic

non-woven ply are completely straightened-out. Fig 5 shows part pieces of the inner layer 4 and the external layer 14 of the diaper as well as a coat 39 of an adhesive coating, viz. the producer's bonding face, disposed between the tape fastener and the inner ply.

5

Figs. 7a-7c show a mechanical tape fastener 25 having a hook-and-loop fastener 32a. Also, fibers 32c to which hooks of a hook-and-loop fastener fasten to are provided on the inner layer 4.

- 10 Figs. 8a-8c show a mechanical tape fastener 25 having a pressure sensitive adhesive 32b. Also, an elastic part 29a arranged to stretch upon occurrence of load during use of the article is provided.

15 The bond 32 between the middle part 29 of the tape fastener and the producer's bonding part 28 should be of a magnitude ensuring reliable attachment of the mechanical tape fastener to the diaper in the folded tape-fastener position while at the same the bond should not be difficult to break for the person that is about to put on the diaper. Research has shown that the bond is too weak when forces below 0.2 N are sufficient to unfasten a

20 strip having a width of 40 mm, whereas the bond is difficult to break, when forces above about 2.0 N are required to unfasten a strip having a width of 40mm. Thus, the bond functions satisfactorily, when a force in the range of from 0.2 to 2.0 is required to break the bond on a strip having a width of 40mm. Preferably, the required force to break the bond should range from

25 0.5 to 1.5 N for a strip having a width of 40 mm.

The measurement method for determination of the force necessary to break the bond will be described in the following example.

- 30 Testing method for measurement of lamination strength:

The object of this method is to determine the mean value of the force necessary to separate from one another two different sheets of a laminate. This method is applicable to laminates comprising two or several sheets that are joined together by gluing, thermo-bonding or welding.

5

#### Principle

Separate the sheets and attach the individual sheets in a tensile strength tester and hold the non-separated part in a manner ensuring that delamination takes place at an angle of 90°.

10

- Test the material in the transverse and the machine directions.

#### Equipment:

Tensile strength tester

15 Printer with plotter function

Punching or cutting equipment

#### Preparation of specimens:

- Cut or punch specimens of 25x200 mm, five in the transverse direction and five in the machine direction. The strips should be evenly distributed over the entire specimen.
- Condition the specimens for 4-48 hours at an air humidity level of  $50 \pm 5\%$  and at  $23 \pm 2^\circ\text{C}$ .
- Wet specimens: Put the test strips in a sealable plastic bag. Pour de-ionised/ionized water into the bag and seal it. Leave it in a climate-controlled space for 4 hours. Do not wet more test strips at a time than can be delaminated within 30 minutes. In this manner, all test strips will have a "wet time" of between 4 and 4.5 hours.

30 Procedure:

- Prepare the tensile-strength tester in accordance with the apparatus instructions.

Length of clip 50 mm.

Pulling speed 300 mm/min.

5 Speed of paper 300 mm/min.

Calibrate the tensile-strength tester.

Separate the sheets at one end of the test strip.

Attach the edges in the clips.

10 Support the laminated part of the specimen with one hand, loosely and at right angles to the laminated part, during the testing process

Note the force during displacement of the draw-head over 250 mm, i.e., during delamination of a length of 125 mm.

15 In the case of glued laminates: Note when the delamination occurs and note the respective separation codes ~~in accordance with the separation code key shown in Fig 6.~~ Various separation codes and the corresponding separations are shown in Fig 6. A1 = Adhesion break, glue remains on carrier. A2 = Adhesion break, glue transferred to the opposite material. A3 = Alternative adhesion break. B = Rupture of material externally of bond. C = Defective cohesion, glue shattered. E1 = Minor fiber rupture. E2 = Rupture of material in bond.

20 The arrows 61 and 62 show examples of rupture externally of bound and rupture material in bond.

Perform five acceptable tests in the cross-machine direction and five in the machine direction

25

Calculate and note the results:

Calculate the mean force (N/25 mm) and the mean peak value (N/25 mm) of the movement of the draw-head from 10 mm to 210 mm.

30

The force for breaking the bond is proportional to the width of the strip. That is, such that a test result for 25 mm width can be directly transformed to the necessary force for a strip which is 40 mm in width by multiplying by 8/5.

5 The report is to include:

- The number of test strips/specimens

Mean value of the mean delamination force in the transverse direction  
and in the machine direction

Mean value of maximum values

10 Mean value of minimum values

Standard deviation

Specification of separation code list (Example: 2 A1+3B)

Accuracy: 0.01 N

15

Reference: ASTM D 1876-72

The mechanical tape fastener ~~25,26~~25, 26 in accordance with the present invention is attached in folded condition to the inner face of the inner layer 4.

20 The manufacturing process may therefore be performed in a simpler and more reliable manner than in the case of the prior art solutions, such as a ~~solution involving~~ Y-tapes. As mentioned above, all folding steps with regard to the mechanical tape fasteners for the article, in accordance with the present invention may be performed at a considerable lower speed than at  
25 the high web velocities found in modern machines for rational and competitive production of disposable absorbent articles, such as baby diapers.

The manufacturing of the mechanical tape fasteners in accordance with the  
30 present invention can be performed at such a first, lower speed which is only about 5-30 % of a second, higher speed at which the diapers are produced.

The process for manufacturing mechanical tape fasteners includes the following steps[.]:

- 5       A.     A carrier web, ~~for instance~~ e.g., of a three-ply configuration as has been described in connection with the embodiment shown in figure 5, i.e., an intermediate ply in the form of an elastic film, a non-woven ply and a non-elastic ply of a non-woven, is supplied to a manufacturing line for the mechanical tape fasteners.
- 10    B.     A longitudinal edge part of the carrier web is folded over itself.
- C.     The folded edge part is attached to the unfolded part by means of a weak, breakable bond, preferably in the form of thermal or ultrasonic welds. The bond can be in the form of a pattern of linear welds or  
15       spaced apart dots. The bonds can represent a part of a pattern or be randomly distributed.
- D.     In case two rows of carrier webs are formed out of the same base material the carrier web is divided.
- 20    E.     Diaper user attachment means in the form of a web with projecting hooks, intended to form one part of a hook-and-loop fastener are joined to the unfolded parts.
- 25    F.     Diaper manufacturer attachment means, in the form of glue are joined to the folded part of the carrier web so that both user and manufacturer attachment means are facing at the same direction.
- 30    G.     Diaper fastening tabs are formed by cutting the tab carrier material perpendicular to the travelling direction.

H. The diaper fastening tabs, which have been formed at a first low speed, are accelerated from the first, low speed to a second, higher speed, corresponding to the manufacturing speed of the diapers.

- 5 I. The diaper fastening tabs are attached at said second, higher speed to the upward facing side of the diaper material web forming the inner layer of the diapers.

10 An attached diaper fastening tab is shown in figure 3. The outer edge portion 33 externally of the fastening part 31 could possibly be provided with a pressure sensitive adhesive (not shown) when the fastening part with hooks are fastened to the carrier web in step E above.

- 15 The invention is not limited to the examples described above but several modifications are possible within the scope of the appended claims.

The elastic tape fastener may comprise several folds when in its storage condition. This may be appropriate if longer tape fasteners are desired, for  
20 example e.g., when it is desirable to give the diaper itself a more narrow shape. It is, ~~however~~ essential, however, that the number of folds is an odd number to allow the tape fasteners to be attached permanently to the inner layer and by means of the mechanical tape bonding face be joined to the complementary bonding face on the outer face of the outer layer.

25 The tape fastener naturally need not be designed with three plies. The internal non-woven ply 35, for instance, may be dispensed with.

In addition, also the corrugated non-woven ply may be eliminated. One  
30 example of a suitable material of this kind is an elastic film marketed by Tredegar TREDEGAR™ under the name Fabriflex FABRIFLEX™ 106D.

The tape fastener need not either include an elastic part. A suitable non-elastic alternative is a spunbond non-woven product having a weight per unit of 40-100 g/m<sup>2</sup> marketed by PEGAS™ Pegas.

- 5 The above description has been made with reference to a baby diaper. However, the present invention also embraces ~~also-adults'~~ adult diapers and other sanitary disposable absorbent articles that may be attached about the waist of the wearer, such as women's sanitary ~~diapers~~ diapers. The width of the mechanical tape fastener may be in the order of 40mm. If longer tape
- 10 fasteners are desired, the width may be increased for more stability. The width of the tape fasteners should be in the range of 30 to 100mm.